

material of the appurtenance or structural support member; a Design Certifying Engineer must make this determination considering chemical and physical properties of the materials and must specify filler material conforming to the requirements of the ASME Code (incorporated by reference; see § 171.7 of this subchapter).

(ii) Be preformed to an inside radius no greater than the outside radius of the cargo tank at the attachment location.

(iii) Extend at least 2 inches in each direction from any point of attachment of an appurtenance or structural support member. This dimension may be measured from the center of the structural member attached.

(iv) Have rounded corners, or otherwise be shaped in a manner to minimize stress concentrations on the shell or head.

(v) Be attached by continuous fillet welding. Any fillet weld discontinuity may only be for the purpose of preventing an intersection between the fillet weld and the tank or jacket seam weld.

[Amdt. 178-89, 55 FR 37059, Sept. 7, 1990, as amended by Amdt. 178-89, 56 FR 27876, June 17, 1991; Amdt. 178-104, 59 FR 49135, Sept. 26, 1994; Amdt. 178-105, 59 FR 55173, 55174 and 55175, Nov. 3, 1994; 60 FR 17402, Apr. 5, 1995; Amdt. 178-118, 61 FR 51341, Oct. 1, 1996; 65 FR 58631, Sept. 29, 2000; 68 FR 19283, Apr. 18, 2003; 68 FR 75755, Dec. 31, 2003]

§ 178.345-4 Joints.

(a) All joints between the cargo tank shell, heads, baffles, baffle attaching rings, and bulkheads must be welded in conformance with Section VIII of the ASME Code (IBR, see § 171.7 of this subchapter).

(b) Where practical all welds must be easily accessible for inspection.

[Amdt. 178-89, 54 FR 25022, June 12, 1989, as amended by Amdt. 178-118, 61 FR 51341, Oct. 1, 1996; 68 FR 75756, Dec. 31, 2003]

§ 178.345-5 Manhole assemblies.

(a) Each cargo tank with capacity greater than 400 gallons must be accessible through a manhole at least 15 inches in diameter.

(b) Each manhole, fill opening and washout assembly must be structurally capable of withstanding, without leak-

age or permanent deformation that would affect its structural integrity, a static internal fluid pressure of at least 36 psig, or cargo tank test pressure, whichever is greater. The manhole assembly manufacturer shall verify compliance with this requirement by hydrostatically testing at least one percent (or one manhole closure, whichever is greater) of all manhole closures of each type produced each 3 months, as follows:

(1) The manhole, fill opening, or washout assembly must be tested with the venting devices blocked. Any leakage or deformation that would affect the product retention capability of the assembly shall constitute a failure.

(2) If the manhole, fill opening, or washout assembly tested fails, then five more covers from the same lot must be tested. If one of these five covers fails, then all covers in the lot from which the tested covers were selected are to be 100% tested or rejected for service.

(c) Each manhole, filler and washout cover must be fitted with a safety device that prevents the cover from opening fully when internal pressure is present.

(d) Each manhole and fill cover must be secured with fastenings that will prevent opening of the covers as a result of vibration under normal transportation conditions or shock impact due to a rollover accident on the roadway or shoulder where the fill cover is not struck by a substantial obstacle.

(e) On cargo tank motor vehicles manufactured after October 1, 2004, each manhole assembly must be permanently marked on the outside by stamping or other means in a location visible without opening the manhole assembly or fill opening, with:

(1) Manufacturer's name;

(2) Test pressure ____ psig;

(3) A statement certifying that the manhole cover meets the requirements in § 178.345-5.

(f) All fittings and devices mounted on a manhole cover, coming in contact with the lading, must withstand the same static internal fluid pressure and contain the same permanent compliance markings as that required for the manhole cover. The fitting or device manufacturer shall verify compliance

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using the same test procedure and frequency of testing as specified in § 178.345-5(b).

[Amdt. 178-89, 54 FR 25022, June 12, 1989, as amended by Amdt. 178-105, 59 FR 55175, Nov. 3, 1994; 68 FR 19284, Apr. 18, 2003]

§ 178.345-6 Supports and anchoring.

(a) A cargo tank with a frame not integral to the cargo tank must have the tank secured by restraining devices to eliminate any motion between the tank and frame that may abrade the tank shell due to the stopping, starting, or turning of the cargo tank motor vehicle. The design calculations of the support elements must include the stresses indicated in § 178.345-3(b) and as generated by the loads described in § 178.345-3(c). Such restraining devices must be readily accessible for inspection and maintenance, except that insulation and jacketing are permitted to cover the restraining devices.

(b) A cargo tank designed and constructed so that it constitutes, in whole or in part, the structural member used in lieu of a frame must be supported in such a manner that the resulting stress levels in the cargo tank do not exceed those specified in § 178.345-3(a). The design calculations of the support elements must include the stresses indicated in § 178.345-3(b) and as generated by the loads described in § 178.345-3(c).

[Amdt. 178-89, 54 FR 25023, June 12, 1989, as amended by Amdt. 178-105, 59 FR 55175, Nov. 3, 1994; Amdt. 178-118, 61 FR 51341, Oct. 1, 1996]

§ 178.345-7 Circumferential reinforcements.

(a) A cargo tank with a shell thickness of less than $\frac{3}{8}$ inch must be circumferentially reinforced with bulkheads, baffles, ring stiffeners, or any combination thereof, in addition to the cargo tank heads.

(1) Circumferential reinforcement must be located so that the thickness and tensile strength of the shell material in combination with the frame and reinforcement produces structural integrity at least equal to that prescribed in § 178.345-3 and in such a manner that the maximum unreinforced portion of the shell does not exceed 60 inches. For cargo tanks designed to be

loaded by vacuum, spacing of circumferential reinforcement may exceed 60 inches provided the maximum unreinforced portion of the shell conforms with the requirements in Section VIII of the ASME Code (IBR, see § 171.7 of this subchapter).

(2) Where circumferential joints are made between conical shell sections, or between conical and cylindrical shell sections, and the angle between adjacent sections is less than 160 degrees, circumferential reinforcement must be located within one inch of the shell joint, unless otherwise reinforced with structural members capable of maintaining shell stress levels authorized in § 178.345-3. When the joint is formed by the large ends of adjacent conical shell sections, or by the large end of a conical shell and a cylindrical shell section, this angle is measured inside the shell; when the joint is formed by the small end of a conical shell section and a cylindrical shell section, it is measured outside the shell.

(b) Except for doubler plates and knuckle pads, no reinforcement may cover any circumferential joint.

(c) When a baffle or baffle attachment ring is used as a circumferential reinforcement member, it must produce structural integrity at least equal to that prescribed in § 178.345-3 and must be circumferentially welded to the cargo tank shell. The welded portion may not be less than 50 percent of the total circumference of the cargo tank and the length of any unwelded space on the joint may not exceed 40 times the shell thickness unless reinforced external to the cargo tank.

(d) When a ring stiffener is used as a circumferential reinforcement member, whether internal or external, reinforcement must be continuous around the circumference of the cargo tank shell and must be in accordance with the following:

(1) The section modulus about the neutral axis of the ring section parallel to the shell must be at least equal to that derived from the applicable formula:

$$I/C = 0.00027WL, \text{ for MS, HSLA and SS;}$$

or

$$I/C = 0.000467WL, \text{ for aluminum alloys;}$$

Where: